Docket #71105

HEATABLE INCUBATOR HOOD AND PROCESS FOR REGULATING THE TEMPERATURE OF AN INCUBATOR HOOD

FIELD OF THE INVENTION

[0001] The present invention pertains to an incubator hood for an incubator for premature and newborn babies as well as to a process for regulating the temperature of an incubator hood.

BACKGROUND OF THE INVENTION

[0002] Premature and newborn babies who are cared for in an incubator require especially an effective protection from heat losses. The causes for the heat losses can be classified essentially to four different categories, namely, conduction, convection, evaporation and radiation. Conduction means the introduction of heat from the body surface to the bed on which the premature or newborn baby is located. Convention means the release of heat from the body surface to the air flow surrounding the premature or newborn baby in the incubator. Evaporation is defined as the heat of evaporation, which is generated on the body surface of the premature or newborn baby due to the drying air flow in the incubator. Finally, radiation means the heat radiation from the body surface of the premature or newborn baby to the colder surface of the incubator hood. The heat loss caused by radiation accounts for an especially considerable portion of the total heat loss.

[0003] It is described in US 5,119,467 how this heat loss generated by heat radiation from the body surface of the premature or newborn baby to the surface of the incubator hood can be reduced. A conductive layer is integrated as a heat radiation source in the incubator hood, and this layer is connected to a temperature regulating circuit. The temperature regulating circuit comprises temperature sensors, whose signals are used to control the electric power source connected to the conductive layer.

[0004] The fact that a complicated temperature regulation with temperature sensors and a control unit therefor are necessary was found to be a drawback of the prior-art incubator hood.

SUMMARY OF THE INVENTION

[0005] The object of the present invention is to provide an incubator hood for an incubator for premature and newborn babies as well as a process for regulating the temperature of an incubator hood, in which a desired temperature can be maintained with simple and reliable means.

[0006] The object is accomplished according to the present invention with an incubator hood for an incubator for premature and newborn babies that is traversed by heating wires, which are connected to a power source. Temperature-dependent electric resistors are arranged in the heating wires. The heating wires are thin and as a result, they reduce the transparency of the incubator hood only slightly, comparably, e.g., to the heating wires that are used to heat the windshields of motor vehicles.

[0007] In the process for regulating the temperature of an incubator hood, values in the interior of the incubator are first measured by means of measuring means; these values may be, e.g., the air temperature and the relative humidity of the air, and they are sent to an evaluating and control unit, which forms a value for the dew point temperature in the incubator from the measured values on the basis of physical laws. The temperature of the incubator hood is then regulated by the evaluating and control unit and a correspondingly designed circuit with a power source to a temperature value above the value formed for the dew point temperature by means of heating wires which are connected to the power source and traverse the incubator hood.

[0008] The temperature of the incubator hood should advantageously be regulated only when the incubator hood is closed. This can be checked, e.g., with corresponding sensors, and a corresponding signal is then sent to the evaluating and control unit, so that a temperature regulation takes place only if the incubator hood is closed.

[0009] It proved to be advantageous to connect the heating wires in parallel. An extensively uniform temperature distribution in space relative to the incubator hood is facilitated especially if the heating wires are distributed uniformly over the incubator hood and only one of the temperature-dependent electric resistors is arranged in each of the heating wires.

[0010] By applying a low voltage of a few V, e.g., 30 V, to the heating wires, the incubator hood is heated to the desired temperature. The system formed by the heating wires will hereinafter be called panel heating. The temperature-dependent electric resistors are preferably PTC resistors (positive temperature coefficient), which have been known from numerous industrial applications. PTC resistors are characterized, e.g., by a nominal response temperature of about 37°C. The resistance increases very greatly in the temperature range above this, so that the flow of current and consequently the heating effect caused thereby decreases at a preset voltage that is present on the power source. Temperature regulation of the incubator hood to about 37°C is thus guaranteed. The temperature of 37°C is usually above the dew point temperature of the air in the interior of the incubator. The heating effect of the heating wires in the panel heating is coordinated with the temperature characteristic of the PCT resistors being used in a suitable manner.

[0011] Besides the reduced heat loss at the premature and newborn baby located in the incubator, the fact that despite the high humidity in the interior of the incubator, no water of condensation is formed on the incubator hood proved to be another advantage of the incubator hood according to the present invention. Water of condensation is always undesirable, because, on the one hand, it obstructs the view from the outside toward the premature and newborn baby in the incubator and, on the other hand, it facilitates the formation or growth of microorganisms in the interior of the incubator.

[0012] According to another advantageous embodiment, the incubator hood has limiting surfaces which extend vertically or sloped in relation to the horizontal, so that towels and blankets can be hung over it, but objects are, in general, prevented from being placed on the incubator hood. Covering with a towel or blanket is often useful to ensure a quiet and dark environment for the baby in the incubator. The PTC resistors are arranged such that they are also always covered in case of covering with a towel or a blanket. If, e.g., the incubator hood is designed in the form of a saddle roof, the PTC resistors are advantageously arranged in the ridge of the saddle roof. Heat is thus prevented from accumulating in the interior of the incubator.

[0013] Moreover, the fact that the generation of heat in the interior of the incubator is not based on a warm air flow alone any more proved to be a significant advantage of the incubator hood. The velocity of flow and the volume flow of the warm air can be reduced because the heated incubator hood is available as an additional heat source. A reduced velocity of flow leads to the generation of less noise in the incubator. A lower volume flow leads to reduced evaporation on the body surface of the premature and newborn baby. Both effects are desirable.

[0014] In a preferred embodiment of the process for regulating the temperature of the incubator hood, heating wires are used, in which temperature-dependent electric resistors, e.g., PTC resistors, are arranged.

[0015] The temperature value to which the temperature of the incubator hood is regulated is preferably about 1°C to 2°C above the value of the dew point temperature that was formed before by the evaluating and control unit.

[0016] The present invention will be explained below as an example based on the drawings. The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses, reference is made to the accompanying drawings and descriptive matter in which a preferred embodiment of the invention is illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]	Figure 1	is a view at right angles from the top of an incubator hood with heating wires and temperature-dependent electric resistors; and
[0018]	Figure 2	is a lateral cross section along line A-B showing the incubator hood from Figure 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0019] Referring to the drawings in particular, Figure 1 shows a top view of an incubator hood with heating wires 1 and temperature-dependent electric resistors 3. A total of seven heating wires 1 are arranged in parallel. They are wound through the incubator hood in uniform loops. The heating wires 1 are connected to a power source 2 arranged outside the incubator hood. A temperature-dependent electric resistor 3 each is located on the middle path length of each heating wire 1.

[0020] Figure 2 shows the incubator hood from Figure 1 in the lateral cross section along line A-B. The vertically extending limiting surfaces 5 and the limiting surfaces 4 sloped by about 30° against the horizontal in the manner of a saddle roof are shown. One of the temperature-dependent electric resistors 3 is shown on the ridge of the saddle roof.

In the preferred embodiment the heating wires 1 are connected in parallel. One temperature-dependent electric resistors 3 is arranged in each of the heating wires. The temperature-dependent electric resistors 3 are PTC resistors. The heating wires are arranged distributed uniformly in space in the incubator hood.

The incubator hood has vertical limiting surfaces or limiting surfaces extending sloped against the horizontal. The temperature-dependent electric resistors of the incubator hood are used to heat the space of the incubator for premature and newborn babies.

A process is provided for regulating the temperature of the incubator hood. Values in the interior of the incubator are measured with at least one measuring means (a temperature sensor) 20 and are sent to an evaluating and control unit 25, which forms a value for the dew point temperature in the incubator from the measured values. The temperature of the incubator hood is regulated by the evaluating and control unit 25 and a correspondingly designed circuit 30 with the power source 2 to a temperature value above the value formed for the dew point temperature by means of said heating wires 1, which are connected to the power source 2 and traverse the incubator hood.

The air temperature measured by the measuring means (a temperature sensor) 20 with and the relative humidity of the air in the interior of the incubator is measured with a second measuring means 22.

The heating wires 1 in which the temperature-dependent electric resistors 3 are arranged, are used to regulate the temperature. The temperature value to which the temperature of the incubator hood is regulated is about 1°C to 2°C above the value formed for the dew point temperature.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.